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ON THE SHOULDERS OF GIANTS: INFLUENTIAL GEOLOGISTS AND PALEONTOLOGISTS AT PETRIFIED FOREST NATIONAL PARK

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INTRODUCTION

The papers in this volume present some of the latest findings that are the result of a large amount of paleontological and geological research that has taken place in the park during the last decade; however, these findings are heavily based on a large pool of literature based on research that has taken place in the park since the 1920s. As is typical in science, current researchers as well as the staff and visitors to Petrified Forest National Park in general are indebted to these past researchers who have established such a strong literature base. Past researchers are listed in order of their contributions and the main dates of their contributions to the park are listed after thier names.

CHARLES L. CAMP (1921-1927)

In 1906 the naturalist John Muir was staying at the Forest Hotel in Adamana, Arizona adjacent to what was to become Petrified Forest National Monument later that year. Muir was enamored by the vast petrified wood deposits and scenic badlands of the area and in the Second (Crystal) and North (Black) Forests made a small collection of vertebrate material that he subsequently turned over to his friend John C. Merriam, of the University of California at Berkeley (Irmis, 2005). This small collection caught the attention of Annie Alexander, a prolific explorer and heiress who had established the Vertebrate Zoology (MVZ) and Paleontology (UCMP) museums at the Berkeley campus. Moreover, in 1919 another UCMP researcher, Ynez Mexia, had collected a partial phytosaur skull from the Blue Forest area, east of Adamana. In April 1921, Alexander made a brief reconnaissance to the Blue Forest, and encouraged by what she had seen, returned in May with her close friend and field partner Louise Kellogg (Stein, 2001). The two women immediately discovered a large amount of good fossil material including phytosaur and metoposaur skulls from the Blue Forest and Devils Playground areas. Alexander quickly wired Charles L. Camp, who fresh from completing his Ph. D. at Columbia University had recently accepted a position at the UCMP. Camp soon joined the women and proceeded to collect numerous fossil vertebrates. Whereas Alexander had made many of these initial discoveries, she did not conduct any further fieldwork in the region; however, Camp continued working near Adamana four four additional summers and in 1930 published a seminal monograph on the Late Triassic phytosaurs of the southwestern United States based almost entirely on this work (Camp, 1930). Camp continued to visit the Petrified Forest sporadically over the next three decades; however he never initiated further fieldwork in the park, instead focusing on Chinle Formation deposits near St. Johns, Arizona and Ghost Ranch, New Mexico, as well as intensive work in the Middle Triassic Moenkopi Formation of Arizona.

MYRL V. WALKER (1933-1938)

Walker was the first permanent naturalist at Petrified Forest National Park. Trained in paleontology, Walker was friends with Charles Gilmore of the Smithsonian Institution as well as the Sternberg family. In 1932, during road construction through the Tepees area of the monument, workers stumbled upon a large deposit of fossil leaves. When he arrived shortly afterwards, Walker recognized the significance of this deposit and preserved many of the specimens. Walker discovered numerous fossil localities throughout the park and made the first collections of invertebrates, plants, and trace fossils. He also collected several phytosaur skulls, one of which is still on display at the Smithsonian. In 1936, Walker excavated a stand-

Figure *1*. Park naturalist Myrl V. Walker examining a petrified log from the park in 1934.

Figure *2*. Park naturalist Howard R. Stagner with preserved roots in Rainbow Forest.

ing stump in the Flattops area of the monument and was the first to argue that not all of the logs had been transported from outside of the area of the park. Walker (1938) also published a paper documenting insect traces in petrified wood and also arranged for Lyman Daugherty (see discussion below) to study the fossil plant material from the Tepees.

HOWARD R. STAGNER (1939-1941)

Stagner was the second park naturalist, replacing Walker who left in 1939 for an appointment at Zion National Park. Stagner extensively explored the Tepees area discovering and documenting many more plant localities. Stagner was also the first to attempt to relocate and mark many of the known paleontological sites. The stakes that he set at these sites are still visible today. Stagner also wrote the first general stratigraphic description of the Chinle Formation near the Tepees and was the first to use the term "newspaper rock sandstone" (Stagner, 1941).

LYMAN H. DAUGHERTY (1941-1963)

Daugherty was a paleobotanist from San Jose State College who provided the first descriptions of fossil leaves and pollen from the park. Daugherty's (1941) monograph is the foundation for paleobotanical research in the park. Subsequently Daugherty published several more descriptions of material from the park (Daugherty, 1960, 1963). This work is significant because it essentially represented the first new work on Triassic plants in North America since 1883 and demonstrated that there was a well-preserved Late Triassic flora from the western United States. Daugherty also did pioneering work on Late Triassic pollen and spores and many of the taxa erected by Daugherty are still considered valid. This is even more amazing considering that Daugherty made palynological preparations under very primitive conditions in his kitchen at home (S. R. Ash, pers. commun., 2006).

Figure *3*. Park naturalist Phillip VanCleave circa 1950.

EDWIN H. COLBERT (1941-2001)

Edwin "Ned" Colbert was the curator of fossil reptiles at the American Museum of Natural History in New York. In 1945, Colbert traveled to northeastern Arizona with Charles Camp to examine Camp's old Chinle localities. In 1946, Colbert collected several phytosaur skulls from the Devils Playground and Billings Gap areas (Colbert, 1946; Long and Murry, 1995). Colbert was set to return in 1947; however, the discovery of the *Coelophysis* Quarry at Ghost Ranch, New Mexico while enroute to the park derailed those plans. Colbert never conducted paleontological excavations in the park; however, several events that occurred during the 1946 field season directed Colbert towards a more geomorphological study in the park. In the summer of 1946, Colbert had discovered some well-preserved metoposaur material in the Blue Forest area of the park, which he marked and planned on returning to excavate. Unfortunately, a subsequent heavy rainstorm destroyed the material before it could be collected (Colbert, 1946, 1981). A similar event happened concerning a phytosaur skull in the

Devils Playground. Colbert (1981:279) described what happened as follows, "we...located a beautiful phytosaur skull, in situ in the side of a little badland hill along a wash. So we spent the morning exposing it, and then in the early afternoon we encased it, ...in a plaster jacket. At about this point in our work the skies became dark and threatening. It looked like trouble, so we covered our fossil with a cavas tapaulin, weighted down by rock, drove our jeep to high ground, and waited for things to happen. There was thunder and lightning crashing all around us, and then for about twenty or thirty minutes a rainstorm of the utmost violence, during which the wind came up and ripped the canvas cover away from our fossil. Just as the rain slackened off, there was a roar and a wall of water came down the wash, carrying everything before it and completely inundating our beautiful fossil in its cast. There was nothing to do but wait until the water had subsided, at which time we waded through the mud to where the fossil had been. Wonder of wonders and joy supreme! The flood had neatly undercut our specimen and turned it over. All we had to do was load it on the jeep, go down the wash and rescue our tarpulin, and drive back to headquarters."

These two events led Colbert to set three series of wooden stakes at several locations in the Chinle Formation (two are in PEFO) to try to determine erosional rates for these exposures. Colbert (1956, 1966) estimated that 5.7 mm of sediment were removed each year through erosion.

Colbert was a frequent visitor to the park and was on the park's scientific advisory committee until his passing in 2001. His wife, Margaret, painted a mural that is on display at the Rainbow Forest Museum.

PHILLIP F. VANCLEAVE (1956-1963)

Phillip Vancleave is another park naturalist that had a profound impact on paleontological and geological research in the park. Vancleave collected several paleobotanical specimens from the park including a tree-fern that now bears his name (*Itopsidema vancleavei*) (Daugherty, 1960). In the early 1960s Vancleave collected the partial skeleton of a small reptile in the Blue Forest, which Long and Murry (1995) described as a new taxon (*Vancleavea campi*). Vancleave also showed S. R. Ash around the park in 1962 and encouraged Ash to return the following year to conduct research (see discussion below).

MAURICE E. ("SPADE") COOLEY (1953-1965)

Cooley's (1957) unpublished masters thesis on the Chinle Formation focused mainly on Petrified Forest National Park and provided the first stratigraphic scheme for the park, including first usage of the name Rainbow Forest for a stratigraphic unit (Rainbow Forest sandstone). Cooley was also the first to specifically mention the "tuff" bed now formally known as the Black Forest Bed. Cooley's later work in the park concentrated on source areas for extrabasinal clasts from the "Sonsela Sandstone Bed" and as a part-time scientific advisor for various projects.

SIDNEY R. ASH (1962-present)

Sid Ash has published over 80 papers on the geology flora of the Chinle Formation of Petrified Forest National Park. This includes reconstructions of the three dominant fossil woods from the park (Ash and Creber, 2000; Creber and Ash, 2004); leaf, cone, and shoot descriptions (e. g., Ash, 1970a, b, Ash, 1972, Ash, 1973, Ash, 1985, Ash, 1991); descriptions of stratigraphic units (Ash, 1992); as well as discussions of insect-plant interactions (Ash, 1997, 1999, 2000). He also coauthored papers on the first crayfish, amber, and charcoal found in the park and was the first to correlate the major plant fossil localities and forests in the park (Miller and Ash, 1988; Litwin and Ash, 1991; Jones et al., 2002; Creber and Ash, 2002). He is also the author of two popular books about the park (Ash, 1986, 2005). Sid Ash has also served as a frequent scientific advisor to the park and his contributions continue to the present (4 co-authored papers in this volume).

GEORGE H. BILLINGSLEY (1979-1985)

In 1979 George Billingsley was part of a research group from the Museum of Northern Arizona who conducted the first paleontological inventory of the park (Cifelli et al., 1979) and created the first geological map of the park (Billingsley et al., 1985). This preliminary map and subsequent report (Billingsley, 1985) have been the basis for all subsequent geological work done in the park until the recent work of Heckert and Lucas (2002) and Woody (2003).

ROBERT A. LONG (1981-1997)

Robert Long was a researcher at the University of California Paleontological Museum in the early 1980s. Along with Samual Welles and Kevin Padian, he led a project to relocate Charles Camp's old localities and to reinitiate UCMP paleontological research in the park This work continued in 1982-87 and as recently as 1997. Long and colleagues not only relocated almost all of Camp's localities but also discovered numerous new localites and important specimens including the holotypes of *Pseudopalatus mccauleyi* (Phytosauria) and *Chindesaurus bryansmalli* (Saurischia). In 1995, Long published a monograph with Phillip Murry, which is possibly the most cited paper in Late Triassic vertebrate paleontology and is the cornerstone for current research in the southwest-

ern United States. Furthermore, Long and Ballew (1985) was a pivotal paper in Late Triassic vertebrate paleontology that clarified aspects of phytosaur and aetosaur taxonomy and biochronology, and was based mainly upon research in the park.

RONALD J. LITWIN (1983-1991)

Litwin trained under Al Traverse at Penn State, where he received his PhD in 1986, and was the first to provide a detailed palynostratigraphy for the Chinle Formation and was the first to recognize and document the Carnian-Norian boundary in the park and elsewhere in the southwestern United States based on palynomorphs (Litwin et al., 1991). Litwin also was the first to discover amber in the Chinle Formation (Litwin and Ash, 1991).

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ARTICLES

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